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Nutrient and Anti-Nutritional Composition of Jam Prepared from Pineapple Ananas Comosus

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Abstract
An investigation was conducted to evaluate the nutrient and anti-nutritional composition of jam prepared from Pineapple (*Ananas comosus)*. The result of the proximate analysis indicated that processing caused a reduction in the moisture (30.0 $\pm$ 0.08) protein content (0.8 $\pm$ 0.008). However, processing pineapple to jam caused an increase in the crude lipid (3.4 $\pm$ 0.26), Carbohydrate (58.6 $\pm$ 0.30), Ash content (5.0 $\pm$ 0.8) and crude fibre (2.2 $\pm$ 0.08). The result obtained for the anti-nutritional factors showed that processing caused a reduction in phytate content (0.67 $\pm$ 0.004), Tannin (0.19 $\pm$ 0.004) and Oxalate (8.64 $\pm$ 0.008).
Keywords: *Ananas comosus,* Processing, Jam, Tannin, Crude Fat, Oxalate.

INTRODUCTION

Jam is a sweetener; a sweetener is a food additive that duplicates the effect of sugars in taste usually with less food energy. Jam contains both fruit juice and pieces of the fruits (or vegetable's) flesh, properly the term 'jam' refers to a product properly made with whole fruit, cut into pieces or crushed. The fruit is heated with water and sugar to activate the pectin in the fruit. Jams are usually made from pulp and juice of one fruit rather than a combination of several fruits.

Pineapple (*Ananas comosus*), is a tropical plant with edible multiple fruits consisting of coalesced berries and named for resemblance to the pine cone (Eechenbrugge and Geo, . 2003).

Unlike many other fruits, pineapple does not ripen at post harvest, so it is picked when it is ripe (Maxwell and Betty; 1984). The pineapple is a herbaceous perennial which grows 1.0 to 1.5 meters (3.3 to 4.9 ft) tall, although, sometimes it can be taller. In appearance, the plant itself has a short stocky stem with tough waxy leaves. When creating its fruits, it usually produces up to 200 flowers, although same large-fruited cultivated can exceed this. Cause it flowers, the individual fruit of the flowers join together to create what is commonly referred to as a pineapple.

Pineapple contains mainly water, carbohydrates, sugars, vitamins A, C and beta-carotene, low amounts of protein, fat, ash, fibre and antioxidants (flavonoids).

Both the root and fruit may be eaten or applied topically as an anti-inflammatory or as a proteolysis agent. In some practices, it may be used to induce abortion of menstruation (Morton, 1987) or as an anti-helminthic agent (Manzan and Adebowale 1995). It was discovered that Bromelain purified from pineapple stem or fresh juice, then provided in the diet over six months, decreased the severity of colonic inflammation in mice with experimental colitis (Hale *et al* 2010). In the tropics, pineapple is grown and used as a medicinal plant; it contains the enzyme Bromelain (protease) which has several therapeutic properties including maligrant cell growth, thrombus formation, inflammation, control of diarrhea, dermatological and skin debridement (Tochi *et al*, 2008).

According to Tochi *et al (2008)*, available evidence indicates Bromelain is well absorbed orally with its therapeutic effects being enhanced in a dose dependent manner. The terms 'preserves' is usually interchangeable with 'jam'. The terms 'jam' and 'jelly' are used in different parts of the English-speaking world in different ways. In the United States, both jam and jelly are sometimes referred to as 'jelly', whereas in the United Kingdom, Canada, India and Australia, the two terms are more strictly differentiated. In, Australia and South Africa, the term 'jam' is more popularly used as a generic term for both jam and jelly (Howard and Patten 1960).

In general, jam is produced by taking mashed or chopped fruit or vegetable pulp and boiling it with sugar and water. The proportion of sugar and fruit varies according to the type of fruit and its ripeness, but a rough starting point is using equal weights of each. The mixture is then boiled and when it reaches a temperature of 104^0C (219^0F), the acid and the pectin in the fruit react with the sugar and the jam will set on cooling.

AIMS AND OBJECTIVES OF THE RESEARCH

- To determine the proximate nutrient content, fibre and total sugar of processed jam prepared from *Ananas comosus*.

- To assess the concentration of same anti-nutritional factors of processed jam from *Ananas comosus*.

MATERIALS AND METHODS

This work was carried out between April and November 2012, in the Chemistry Laboratories at the National Research Institute for Chemical Technology (NARICT), Zaria, Kaduna State.

SAMPLE COLLECTION

Processed pineapple jam was purchased from Central Market in Kaduna Metropolis, Kaduna, Kaduna State, Nigeria.

PROXIMATE ANALYSIS

The moisture, crude protein, ether extract, crude fibre, ash and nitrogen free extract content of the sample was determined by the methods described by AOAC (1999).

DETERMINATION OF MOISTURE CONTENT (AOAC, 1999)

This is based on the difference between the wet weight and the weight after oven drying of the sample to a constant weight. The empty dish and lid were dried in an oven at 105^0C for 3 hours and transferred to desiccators to cool and then weighed. The sample (3.0g) was put into the dish (W1). The sample was dried in an oven for 3 hours at 105^0C. After drying the dish was transferred to desiccators to cool. The dish was reweighed and dried (W2).

CALCULATION

$$\text{Moisture} = \frac{(W_1 - W_2)}{W_1} \times 100$$

Where: W_1 = Weight (g) of sample before drying
W_2 = Weight (g) of sample after drying

DETERMINATION OF PROTEIN CONTENT (AOAC, 1999)

The sample (1.0g) was placed in a digestive flask, Kjeldahl catalysts (5.0g) and 200ml of concentrated H_2SO_4 (0.023M) were added. A tube containing the above chemicals was prepared except as blank, placed in an inclined position and heated gently until frothing ceased and boiled briskly until solution cleaned. After cooling, 60ml of distilled water was cautiously added. Immediately, the flask was connected to digest on condenser, immersed in standard acid and 5 drops of indicator were added, the receiver was removed, tip of condenser washed and titrated with excess standard acid.

CALCULATIONS

$$\text{Protein (\%)} = \frac{(A - B) \text{ X } N \text{ X } 1.4007 \text{ x } 6.25}{W_1}$$

Where: A = Volume (ml) of 0.2N HCl used in sample titration.
B = Volume (ml) of 0.2N HCl used in blank titration.
N = Normality of HCl
W = Weight (g) of sample
1.4007 = Atomic weight of Nitrogen
6.25 = The Protein Nitrogen Conversion Factor and its by-product

DETERMINATION OF ASH CONTENT

The crucible and lid were placed in the furnace at 550^0C overnight to ensure that impurities on the surface of the crucible were burnt off. The crucible was cooled in the desiccators for 30 minutes and weighed. The sample (5.0g) was weighed into the crucible (W1)and heated over low Bunsen flame with lid half covered. When fumes were no longer produced, the crucible and lid were placed in furnace, heated at 5500C overnight, during heating, the lid was removed, and replaced after the heating was completed, then cooled in the desiccators. The ash with crucible and lid were weighed when the sample turned Grey (W2).

CALCULATION

$$\text{Ash (\%)} = \frac{\text{Weight of ash (g)}}{\text{Weight of sample}} \times 100$$

$$= \frac{(W_2 - W_1)}{W_1} \times 100$$

Where: W_1 = Weight (g) of sample before heating

W_2 = Weight (g) of sample after heating

DETERMINATION OF LIPID CONTENT

A sample bottle and lid were placed in an incubator of 105^0C overnight to ensure weight stability after which 3.0g sample was weighed. The sample was taken into an extraction thimble and transferred into a soxhlet extraction. Petroleum ether (250ml) was added into the bottle and placed on a heating mantle. With the soxhlet apparatus connected and switched on with heating done for 14 hours. The solvent was evaporated using vacuum condenser. The bottle and contents were incubated at 80 – 900C until solvent was completely evaporated. After drying it was transferred to a desiccators to cool. The bottle and its dried contents were reweighed.

CALCULATIONS

$$\text{Fat (\%)} = \frac{\text{Weight of Fat}}{\text{Weight of Sample}} \times 100$$

DETERMINATION OF CRUDE FIBRE (AOAC 1999)

The sample (2.0g) was weighed into round bottom flask. $100cm^3$ of 0.023M H_2SO_4 solution was added and the mixture boiled under reflux for 30 minutes, the hot solution was filtered with insoluble matter washed with hot water until free of acid and transferred into a conical flask. 100cm3 of hot (0.312M) NaOH solution was added and boiled under reflux for 30 minutes and quickly filtered, residue was weighed, washed with acetone, dried to constant weight in an oven, cooled in a desiccators and weighed in a crucible (W2). The crucible and its content were incinerated in a muffle furnace at 550^0C for 2 hours, cooled in a desiccators and reweighed (W3).

CALCULATION

$$\text{\% Fibre} = \frac{\text{Weight of insoluble matter – Weight of ash}}{\text{Weight of sample (g)}} \times 100$$

$$= \frac{W_2 - W_3}{W_1} \times 100$$

Were: W1 = Weight (g) of sample
W2 = Weight of (g) of insoluble matter
W3 = Weight of (g) of ash

DETERMINATION OF CARBOHYDRATE CONTENT (AOAC 1999)

Carbohydrate as nitrogen free extract was calculated by difference.
Carbohydrate (%)=
100 – (% crude protein + % crude fibre + ether extract + % Ash + % Moisture)

ANTI-NUTRITIONAL SCREENING

DETERMINATION OF TANNIN CONTENT (Allen *et al,* 1974)

The sample (5.0g) was boiled with 400ml of distilled water for 30 minutes. The extract was cooled and transferred to 500ml flask to make up the volume. Aliquots (10ml) were put in 10 clean test tubes, 0.5ml of Folin-Denis reagent and 1ml of sodium carbonate solution were added to each tube. The tubes were make up to 10ml with distilled water, mixed and then kept undisturbed for 30 minuets with the absorbance read of 760mm against reagent blank.

CALCULATION

$$\text{Tannin as tannic acid} = \frac{\text{Mg Tannic acid x dilution}}{\text{10 x Aliquot Volume X sample weight (g)}}$$

DETERMINATION OF PHYTATE CONTENT (Reddy 1987)

The sample (4.0g) was soaked with 100ml of 2% HCl for 5 hours and filtered. The filtrate ($25cm^3$) was measured into a conical flask, 50cm3 0.5% potassium thicyonate solution was added and the mixture titrated with a standard 1.04% $^w/_v$ iron (III) chloride until a brownish-yellow colour persisted for 5 minutes.

CALCULATION

$$\text{Concentration of Phytate} = \frac{\text{Titre Value}}{\text{Weight of Sample}} \times 100$$

DETERMINATION OF OXALATE (Okwu, 2004)

The sample (2.0g) was digested with 10ml 6M HCl for 1 hour and made up to 250ml in a volumetric flask. The pH of the filtrate was adjusted with concentrated NH_4OH solution until the colour changed from pink to faint pink. The solution was allowed to stand overnight, the suspension was then centrifuged at 2500 rpm after which the supernatant was decanted and precipitated completely and dissolved in 10ml hot 20% $^{w}/_{v}$ H_2SO_4. The filtrate resulting from the solution in H_2SO_4 was made up to 300ml. 125ml of the filtrate was heated until near its boiling point, and then titrated against 0.05M standard $KMnO_4$ solution to a faint pint colour that persisted for 30 seconds after which burette reading was taken, oxalate value content was evaluated from the fitre value.

CALCULATION

Formulae = $\frac{T \times (Vme) - (Df) \times (mg/100g)}{(ME) \times Mf}$

Where: T = Titre value of $KMnO_4$ in ml
Vme = Volume of mass equivalent
Df = Dilution factor
ME = Molar equivalent of $KMnO_4$ in oxalate
Mf = Mass of samples used

RESULTS

Results obtained for the proximate composition showed that processed pineapple had an increase in ash, lipid, crude fibre and carbohydrate compared to that of raw pineapple. However, there was reduction in the moisture and protein content of the processed jam compared to the raw pineapple. The values for the proximate composition are shown in table 1 below.

Table 1 showing the result of Proximate Composition

PARAMETERS	PINEAPPLE JAM (%)
Crude Protein	0.8 ± 0.008
Crude Fibre	2.2 ± 0.08
Lipid	3.40 ± 0.26
Carbohydrate	58.6 ± 0.30
Ash	5.0 ± 0.08
Moisture	30.0 ± 0.08

Each value is a mean ± standard deviation for 3 determinations.

The results obtained for the anti-nutritional factors showed that processing caused a significant reduction in the concentration of Tannic, Phytate and Oxalate compared to the raw pineapple as shown in table 2 below.

Table 2 showing the Result o Anti-Nutritional Composition

PARAMETERS mg/100g	PINEAPPLE JAM (%)
Phytate	0.67 ± 0.004
Oxalate	8.64 ± 0.008
Tannin	0.19 ± 0.004

Each value is a mean of ± standard deviation for 3 determinations.

DISCUSSION

The average carbohydrate content (58.6%) which is the highest parameter, will be a good source of carbohydrate. It increased significantly compared to the raw which was reported by USDA Nutrient Database. Carbohydrate provide readily accessible fuel for physical performance and regulate nerve tissue transmission (Whitney and Rolfes, 2005).

Average moisture content (30.0%) was the second highest parameter noted. The average moisture decreased significantly from 86.4g which was reported by USDA Nutrient Database. The average crude fibre (2.2%) obtained implied that they can serve as a source of dietary fibre (Agostoni *et al*, 2001) and can be employed in the treatment of diabetes, obesity and gastrointestinal tract disease because they increase peristaltic bowel movements. It is also an indication that it contains a proportion of Cellulose, Hemicelluloses and Lignin (Saldanha, 2003).

The average crude fat content (3.4%) showed an increase compared to the raw pineapple reported by USDA Nutrient Database which are universally stored forms of energy in living organisms. They are major structural elements of biological membranes as phospholids and sterols (Nelson and Cox, 2008). The average ash content (5%) which increased significantly compared to the raw pineapple (0.24g) is a reflection of the mineral

contents preserved in the leaves. Minerals are essential for the proper functioning of tissues and act as second messengers in some biochemical cascade mechanisms. (Antia *et al*, 2006). Average catalysts, mediate cell responses, control growth and cell differentiation (Whitney and Rolfes, 2005).

Tannins (0.19mg/100g) which were found in the plant, are known to be effective in the treatment of some throat, diarrhea and haemorrage. Tannins precipitate with iron and other metals, thereby reducing their absorption. The plant produces tannic acid as a defence and protective tool. Oxolates (8.64g/100g) affects calcium and magnesium metabolism and react with proteins to form complexes which have an inhibitory effect on peptic digesting (Akande *et al*, 2010). Phytic acid (0.67mg/100g) (inositol hexaphosphate) in plants binds calcium in the intestinal luman, preventing its absorption as well as other mineral (Nobari *et al*, 1994).

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REFERENCES

Akande, K.E., Doma U.D., Agu, H.O and Adamu, H.M. (2010). Major Anti-Nutrients found in pan protein sources. Their effect on nutition. Pak J. Nut 9:827 – 832.

Agostoni, C., Giovanni M, and Biassucci. G (2001) Cholesterol in Italian in infants and children. *American Journal of Clinical Nutrition. 75 (5:5supply)*

Allen, R.J., Hamaker, J.P, Wellington, K.J (1974) Astron Astrophy. 3:Pp 77.

Antia, R.J., Akpan, E.J., Okon, P.A. and Umoren I.U. (2006). Nutritive and Antinutritive evaluation of sweet potatoes (*Ipomoea batatus*) leaves Pak. J. Nut, 5:166 – 168.

AOAC (1999). Official method of analytical chemistry 5th edition Association of Analyteical Chemist Washington D.C 205, 294:2342 – 2351.

Coppens d' Kenbrugge, Geo; Freddy Leal (2003) 'Chapter 2: Morphology, Anatomy, and Taxonomy in D.P. Bartholomew, R.E. Paul and K.G Rohrbach. The Pineapple: Botany, Production and Uses Wallingford, U.K: CABI Publishing P. 21.

Hale, L.P. Chichlowski, M., Trinh, C.T. Grear, P.K (2010): "Dietary Supplementation with fresh Pineapple Juice decreases inflammation and colonic Neoplasia in IL – 10 – Deficient Mice with colifis." Inflamm Bowel Dis 16 (12): 2012 – 21.

Howard, L. and Patten, M (eds), (1960). The Australian Women's Weekly Cooking Colour, Paul Hamlin LTD, London U.K., Pp 956 – 971.

Maxwell, S. and Betty M. (1984). Florida fruits, Lewis S. Maxwell Publisher. Pp 12 – 14.

Manzon, R.B., and Adebowale ,A(1995). "Traditional Medicine in the treatment of parasitic diseases in the Philippine" *Journal of Tropical Medicine and Public Health 26(3): 421 – 428.*

Morton, F. (1987). "Pineapple (*Ananas comosus*)" Retrieved 22 April, 2011. http://www.hart.purdue.edu/newcrop/morton/pineapplehtml.

Nelson, D.L. and Cox, M.M (2008). Lehninger Principles of Biochemistry. 5th Edition, W.H. Freeman and Company. Madison Avenue, New York, Pp. 343.

Okwu, D.E (2004). Phytochemicals and Vitamin content of indigenous species of Southeastern Nigeria*. J. Sustain Agric Eviron, 6:30-37.*

Reddy, N.R. (1987). "Phytate in legumes and cereals" Adrfood Res. 28:1-9.

Saldanha, L.G., (2003). Fibre in Diet of U.S. Children: Results of National Survey Pediatrics, 96:994 – 996.

Tochi, B.N., Wang, Z. Xu, S-Y and Zhang W. (2008). Therapentic Application of Protease (Bromelain): A Review. *Pakistan Journal of Nutrients 7(4): 513–520).*

Whitney, E. and Rolfes ,S(2005). Understanding Nutrition, 10th edition, P. 6 Thompson Wadsworth Publishing Company.

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